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**Sampling and Analysis Plan for
Calendar Year 2005 RCRA
Well Drilling for Low-Level
Waste Management Area 4**

B. A. Williams
P. E. Dresel

January 2005



Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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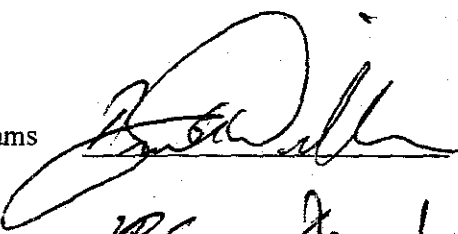

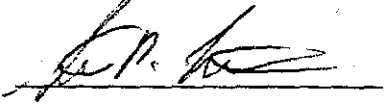

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Hanford Groundwater
Performance Assessment Project

**Sampling and Analysis Plan for
Calendar Year 2005 RCRA
Well Drilling for Low-Level
Waste Management Area 4**

January 2005

Approvals

Technical Leads:	Bruce Williams		Date: <u>1/20/05</u>
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Task Lead:	Stuart Luttrell		Date: <u>1/24/05</u>
Quality Engineer:	Tom Walker		Date: <u>1/20/05</u>

Summary

This sampling and analysis plan (SAP) specifies data to be collected in association with drilling three new *Resource Conservation and Recovery Act* (RCRA) wells located downgradient of the Low-Level Waste Management Area (LLWMA) 4 in calendar year (CY) 2005. This document specifies the activities for data collection to assure the data and associated measurement errors are appropriate to meet the quantitative and qualitative needs of the Groundwater Performance Assessment Project.

The justification for the new wells can be found in the *Data Quality Objectives Summary Report for Establishing a RCRA/CERCLA/AEA Integrated 200 West and 200 East Area Groundwater Monitoring Network* (CP-15329). The installation of the wells has been approved via Tri-Party Agreement (Ecology et al. 1989) Milestone M-24-57.

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1.0 Objective

The objective of this sampling and analysis effort is to collect sediment samples, geophysical logs, and aquifer test data from the newly installed boreholes for use in updating the site hydrogeology, developing site conceptual flow models, and to support final-status groundwater detection monitoring at the Low-Level Waste Management Area (LLWMA) 4. The sediment samples and geophysical logs will be used to evaluate the formation materials in the vadose zone and uppermost aquifer. The aquifer test results will be used to evaluate the hydraulic properties of the aquifer. Data collected from these wells during drilling and groundwater sampling and analysis will also be used to support decisions made for the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 200-ZP-1* Operable Unit.

2.0 Well Locations and Well Construction

The new wells will be drilled downgradient of the LLWMA 4 in the 200 West Area. The well locations are shown on Figure . The new well C4683 (299-W15-83) is located north of C4684 (299-W15-94) and is approximately 122 m (450 ft) south of the northeast corner of the 218-W-4B burial ground. Well C4684 (299-W15-94) is located approximately 91 m (300 ft) south of well 299-W15-16. C4685 (299-W15-152) is located adjacent to decommissioned well 299-W15-18. The exact well locations have been staked by the Pacific Northwest National Laboratory (PNNL) project scientist.

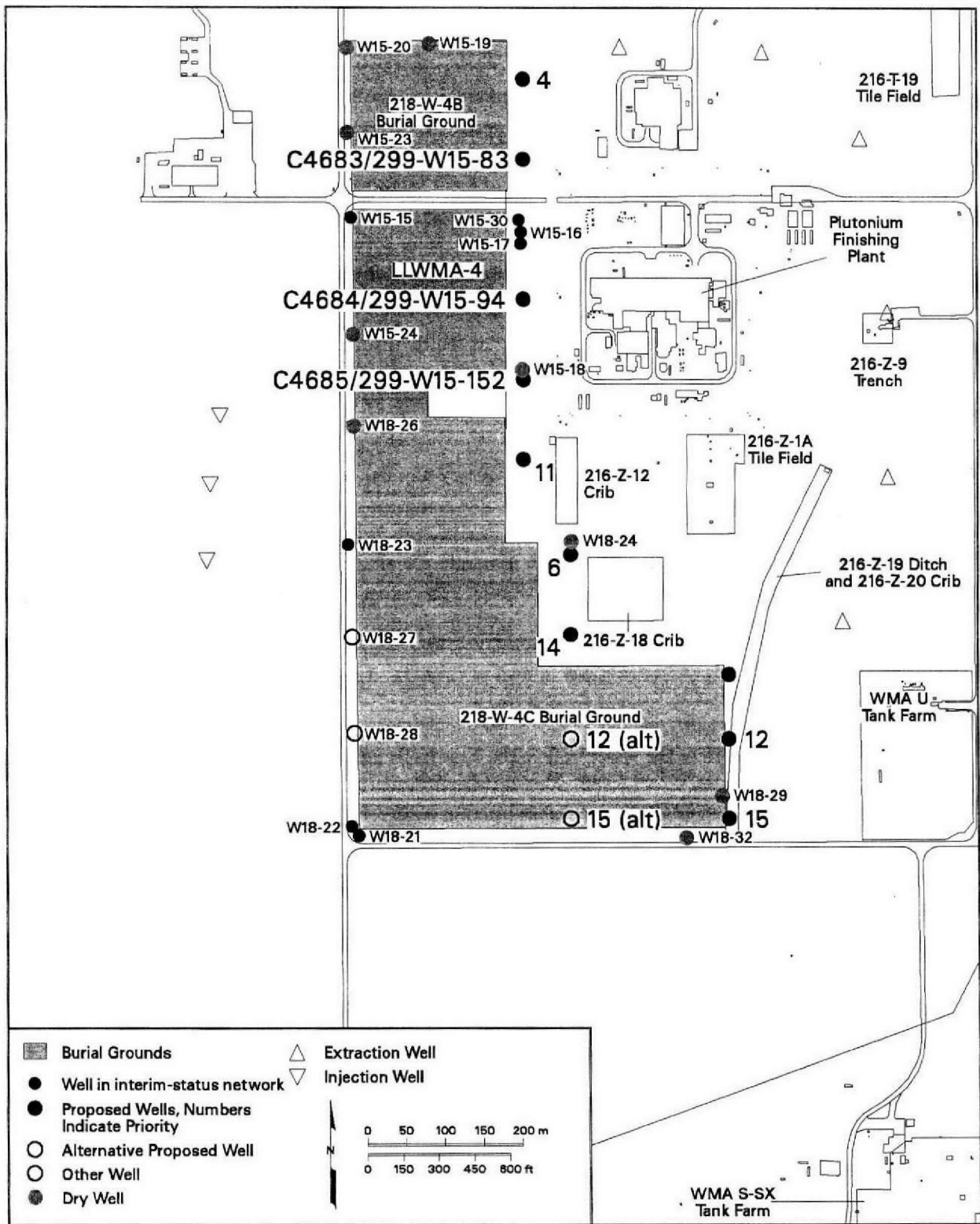
The new wells are to be drilled to a total depth of 84.1 m (276 ft). The water table is expected approximately 72 m (236 ft) below ground surface (bgs).

The new wells will be screened at the water table. The new wells are to be constructed as resource protection wells as defined in WAC 173-160. Detailed requirements for well construction are in the well data sheets from PNNL to the lead drilling and construction contractor.

3.0 Data Collection Activities

Data collection activities associated with drilling the new wells include the following:

- Geologic description of sediment encountered during drilling.
- Collection of sediment samples returned to the surface during drilling.
- Water level measurements.
- Geophysical logging.
- Well development parameters (drawdown during pumping and recovery).
- Aquifer testing.
- Deviation survey to determine borehole deviations caused by drilling.



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Figure 1. Location Map for Three New Wells at Low-Level Waste Management Area 4, Calendar Year 2005

3.1 Geologic Description

Continuous geologic description of drill cuttings will be logged. The purpose of the descriptions is to record the physical appearance and conditions of the vadose zone and saturated zone sediment to be used in conceptual models of subsurface hydrogeologic conditions. The geologic log will include descriptions of the following:

- Drilling conditions and changes in drilling conditions (e.g. drilling method, drill rate, addition of water, heaving sand).
- Depths of all collected samples.
- Lithologic descriptions of sediment.
- Water levels.

Procedures will be followed for geologic descriptions.

3.2 Collection of Sediment Samples

The purposes of the sediment samples are to (1) provide physical samples to aid geologist's description of lithologies, (2) provide a sample for future testing of physical or chemical properties as needed, and (3) provide an archive record of hydrogeologic conditions encountered during drilling.

Representative sediment samples will be collected at 1.5-m (5-ft) intervals throughout the entire borehole. Additional samples will be collected at significant changes in lithology or at depths where unusual conditions or sediments are encountered. Samples will be collected in pint or quart, glass jars capable of sealing existing moisture in the sample for a reasonable time period. If representative samples can not be collected (for example, if large particles do not fit in the container), notes describing the condition of the sample will be put in the geologist's log. The samples will be archived in the Geotechnical Sample Library after collection. All sediment samples will be labeled with the borehole number, sample depth, and date of sample and documented on the geologist log.

In addition to the archived samples, small volume samples for chip trays will be collected.

No sediment samples will be collected from zones of subsurface contamination that would prohibit the uncontrolled transport of the samples to the Geotechnical Sample Library in the 300 Area. The presence or absence of contamination will be determined by surveys using hand held instruments in the field conducted by radiological control technicians.

All sediment samples will be collected according to approved procedures. Chain of custody is not required for sediment samples.

3.3 Water-Table Measurements

Water-level measurements will be taken several times during well drilling, construction, and development. The purpose of the measurements is to aid understanding of the hydraulic properties of the aquifer through which the borehole is drilled. These properties are used to (1) decide well construction

details such as screen slot size, length and depth, and pump depth, (2) interpret aquifer flow direction, and (3) interpret subsurface contaminant movement.

Water-level measurements will be monitored during drilling and construction activities and well development. Water level measurements should be recorded to the nearest 0.003 m (0.01 ft).

3.4 Borehole Deviation Surveys

A borehole deviation survey will be conducted in each new borehole to evaluate the amount of deviation from vertical. The amount of deviation is used to make corrections to depth-to-water measurements and determine water-table elevations. The deviation survey will be done with a down-hole gyroscope in each well prior to sample pump installation.

3.5 Geophysical Logging

Spectral gamma geophysical logging will be conducted in the new boreholes. The purpose of the logs is to determine the depth distribution of any gamma emitting contaminants around the borehole and to interpret subsurface lithology. The borehole will be logged throughout the entire drilled depth.

Geophysical logging will be done according to appropriate approved procedures.

4.0 Aquifer Testing

Aquifer testing will be done in the completed wells following construction activities and will be coordinated by the hydrologic test team. These tests are independent of activities associated with drilling and construction of the new wells. Details of the aquifer tests will be included in separate test plans. The test suite may include slug tests, tracer-dilutions tests, tracer pump back tests, constant-rate pumping tests, and vertical flow, in-well tracer tests.

5.0 Well Screen Interval

The new wells will be completed at the water table with a 10.7-m- (35-ft-) long well screen consistent with existing detection monitoring network wells. The new wells, screened at the water table, will be added to the existing LLWMA 4 monitoring network and will improve detection monitoring for potential releases downgradient from the LLWMA 4.

6.0 Project Organization and Responsibilities

The project scientist for LLWMA 4 is Dr. P. E. Dresel (376-8341). The technical point of contact for this project is Mr. Bruce A. Williams (372-3799).

PNNL is responsible for:

- This sampling plan.
- Preparation and delivery of the Well Data Sheet to the lead drilling contractor specifying well drilling, characterization (geophysical logging, sediment sampling, and aquifer testing, etc) and construction requirements.
- Modifications to this sampling and analysis plan as field conditions warrant.
- Aquifer testing design and implementation.

Lead drilling contractor is responsible for:

- Well site geologic activities.
- Collection of sediment samples.
- Collection of water level measurements.
- Conducting geophysical logging.
- Conducting gyroscope well deviation survey.
- Support to hydrologic testing activities.
- Health and safety at the drill site.
- Waste management at the drill site.

7.0 Health and Safety

The overall responsibility for field health and safety at drill sites belongs to the lead contractor, who will assure that all applicable and required health and safety documentation, training, and practices are up to date and complied with. Any activities done at the well site by PNNL staff will comply with the site health and safety plan. PNNL staff will also adhere to the requirements of internal safety rights and responsibilities procedures and policies.

8.0 Documentation and Records

Test conditions associated with sampling will be recorded by the well-site geologist. The water level measurement and deviation survey data will be recorded by the lead contractor or their subcontractors in accessible field forms and/or field notebooks; PNNL will obtain these data from the lead contractor or their subcontractors. When all data have been compiled, the test results will be reported as a letter or PNNL project document (e.g., Borehole Data Packages).

9.0 Changes

The project scientist, Dr. P. E. Dresel (376-8341), or his designee will provide specific direction to modify this sampling and analysis plan as field conditions warrant. These deviations will be recorded in the field forms and/or field notebooks.

10.0 References

CP-15329. 2003. *Data Quality Objectives Summary Report for Establishing a RCRA/CERCLA/AEA Integrated 200 West and 200 East Area Groundwater Monitoring Network*. Prepared by Fluor Hanford, Inc. for the U.S. Department of Energy, Richland, Washington.

Ecology - Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy. 1989, as revised. *Hanford Federal Facility Agreement and Consent Order*. Document No. 89-10 (The Tri-Party Agreement), Olympia, Washington.

RCRA - *Resource Conservation and Recovery Act*. 1976. Public Law 94-580, as amended, 90 Stat. 2795, 42 USC 6901 et seq.

WAC 173-160. "Minimum Standards for Construction and Maintenance of Wells." *Washington Administrative Code*, Olympia, Washington.